In the Claims:

1. – 40. (Canceled).

41. (Original) A method for performing biopsies and other diagnostic or therapeutic procedures comprising placing an invasive optical assembly apparatus on the distal end of a needle, inserting said optical assembly and needle into vasculature or other organs, and using said optical assembly to provide visual feedback of said biopsies and diagnostic or therapeutic procedures.

42. (Original) A method for viewing through blood in Situ comprising injecting a controlled amount of fluid into blood in the immediate region in front of an invasive optical assembly, temporarily changing the optical characteristics of the blood in said immediate region, and thereby improving visibility through said blood.

43. (Original) A method for viewing through blood in Situ comprising injecting a controlled amount of fluid into blood in the immediate region in front of an invasive optical assembly, temporarily changing the reflectance of the liquid portion of said blood, and improving visibility through said blood.

44. (Original) A method for viewing through blood in Situ according claim 42 wherein said fluid is used to change the optical characteristics of blood in Situ to facilitate imaging through said blood, said fluid being a physiological fluid, such as saline, or a hypoosmolar fluid, such as 0.45% saline or 1/6 saline.

45. (Original) A method for viewing through blood in Situ according to claim 42 wherein said fluid for use in changing the optical properties of blood in Situ to facilitate imaging through said blood, said fluid being a blood substitute which does not contain red blood cells and has homogenous optical characteristics.

46. (Original) A method for viewing through blood in Situ according to claim 42 wherein said fluid is chosen to enable illumination to facilitate imaging through said blood and the environment in Situ with an IR illumination source, enabling a frequency shift so that a visible light sensor can be effectively used.

47. (Original) A method for viewing through blood in Situ according to claim 42 wherein said fluid is chosen to be oxygen carrying, such as a blood substitute, to reduce the risk of hypoxia to the heart muscle.

48. (Original) An invasive imaging control apparatus comprising:

i. A flexible catheter with a proximal end and a distal end, said distal end being shaped for insertion into a blood vessel along a guide wire thereby to reach remote places in the vasculature or other organs.

ii. An optical assembly positioned at the distal end of said catheter.

iii. At least one working channel running from the proximal to the distal end of said catheter.

iv. A control unit for regulating the opacity level of blood in said blood vessel around said distal end of said catheter, controllably injecting quantities of fluid into said blood vessel in the vicinity of said optical assembly, thereby enhancing visibility.

49. (Original) Apparatus according to claim 48 wherein said optical assembly comprises an illumination sensor operable to sense at least one wavelength taken from within a range from visible light to infra-red light.

50. (Original) Apparatus according to claim 48 wherein said working channel is usable for controllably passing through fluid to said distal end of catheter.

51. (Original) Apparatus according to claim 48 wherein said control unit is connectable to the proximal end of said catheter from outside of the patient's body.

52. (Original) Apparatus according to claim 48 wherein said control unit is operable to control the timing and amount of injection of said fluid.

53. (Original) Apparatus according to claim 52 wherein the injection of said fluid is synchronized with the operation of said optical assembly, synchronizing said operation and said injection with the cycle of patient physiological conditions.

54. (Original) Apparatus according to claim 48 wherein said fluid is insertable into the immediate region of said distal end of said catheter to change the optical characteristics of blood in said immediate region.

55. (Original) Apparatus according to claim 48 wherein said fluid comprises one or more fluids selected to modify the optical characteristics of blood plasma to render said optical characteristics to be as close as possible to those of red blood cells.

56. (Original) Apparatus according to claim 53 wherein said physiological condition is heart beat sensible using a heart rate sensor connectable to a patient's body from outside of said patient's body or insertable into said blood vessel through said catheter.

57. (Original) Apparatus according to claim 56, wherein said heart rate sensor comprises a plethysmograph.

58. (Original) Apparatus according to claim 56 wherein information from said heart rate sensor is transferred to said central control unit enabling synchronization with said physiological conditions.

59. (Original) An invasive imaging control apparatus comprising:

i. A flexible catheter with a proximal end and a distal end, said distal end being shaped for insertion into a blood vessel along a guide wire thereby to reach remote places in the vasculature or other organs.

ii. An optical assembly positioned at the distal end of said catheter.

iii. At least one working channel running from the proximal to the distal end of said catheter

iv. A semi-permeable membrane positioned at said distal end of said catheter, surrounding said optical assembly extendable to displace blood from around the optical assembly allowing clear visibility.

60. (Original) Apparatus according to claim 59 wherein said membrane is rigid.

61. (Original) Apparatus according to claim 59 wherein said membrane is flexible.

62. (Original) Apparatus according to claim 59 wherein said membrane is inflated and deflated by means of controllably passing a fluid through said working channel to said distal end of catheter.

63. (Original) Apparatus according to claim 59 comprising a control unit connectable to the proximal end of said catheter from outside of the patient's body.

64. (Original) An apparatus according to claim 62 wherein the injection of said fluid is synchronized with the operation of said optical assembly, synchronizing said operation and said injection with the cycle of patient physiological conditions.

65. (Original) Apparatus according to claim 64 wherein one of said physiological conditions is heart beat sensible using a heart rate sensor connectable to a patient's body from outside of said patient's body or insertable into said blood vessel through said catheter.

66. (Original) Apparatus according to claim 65 wherein information from said heart rate sensor is transferred to said central control unit enabling synchronization with said physiological conditions.

67. (Original) A method for reconstructing images by interpolating image data along at least one of the longitudinal and axial axes of a flexible catheter with a distal end inserted into a blood vessel and thereby reaching remote places in the vasculature or other organs, based on image data from both said longitudinal and axial axes, comprising:

i. off-line image training initialization, and;

ii. real-time image data interpolation.

68. (Original) A method of reconstructing images according to claim 67 wherein said off-line image training initialization comprises:

i. training image construction;

ii. reconstruction of a lower resolution new image from said training image;

iii. finding edge directions of said lower resolution image, and;

iv. training a neural network to obtain a set of filters.

69. (Original) A method of reconstructing images according to claim 68 wherein said training image is clipped and rotated to obtain robust edges in each one of a plurality of directions.

70. (Original) A method of reconstructing images according to claim 67 comprising executing local contrast enhancement following said image data interpolation.

71. (Original) A method according to claim 70 wherein said local contrast enhancement comprises:

i. calculating the average intensity of said real time image, yielding an intensity image;

ii. generating a first image by correcting the intensity of said intensity image;

iii. calculating a local contrast image;

iv. generating a second image by enhancing said local contrast image, and;

v. summing said first image and said local contrast image to generate an output image.

72. (Original) A method according to claim 71 comprising generating said first image by modifying the intensity of said real time image using a lookup table.

73. (Original) A method according to claim 71 comprising generating said second image by modifying the local contrast of said real time image using a lookup table.

74. (Original) A method according to claim 67 wherein said real-time data interpolation comprises:

i. finding edge directions of each pixel, and;

ii. interpolating data using an appropriate direction filter from a set of direction filters.

75. (Original) A method according to claim 74 comprising generating said set of direction filters in said off-line image training.